

## Claims

1. A method for positioning mass standards on a MALDI target, comprising the steps of:
  - (1) providing a target having P positions containing a standard and generating mass spectrometric data from these P positions;
  - 5 (2) providing a combination of N positions on the target ( $N < P$ ), and calibrating the mass spectrometric data acquired from the (P-N) positions that do not belong to the current N positions by applying a procedure based on the mass spectrometric data acquired from the current N positions;
  - (3) computing the performance of the current N positions in calibrating the (P-N) positions according to a given criterion;
  - 10 (4) carrying out steps (2) and (3) for a plurality of combinations of N positions on the target; and
  - (5) selecting a combination of N positions that gives a desired performance as a combination that may be used for positioning the standards in the final target layout.
- 15 (2) The method of claim 1, wherein the criterion applied for computing the performance of a combination of N positions is the standard deviation of the statistical distribution of mass differences between the theoretical, exact masses of the standards at the (P-N) positions and the experimentally measured masses at these positions, after calibration by reference to the N positions.
- 20 (3) The method of claim 1, wherein step (5) comprises selecting a combination of N positions with a performance within the best 25% of the N combinations tested.
- 25 (4) The method of claim 4, wherein step (5) comprises selecting the combination of N positions with the best performance of the N combinations tested.
- (5) The method of claim 1, wherein P is equal to the total number of positions on the target.
- 30 (6) The method of claim 1, wherein each position P contains a mixture of at least 4 standard compounds.
- (7) The method of claim 1, wherein step (4) is carried out for every possible combination of N positions.
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8. The method of claim 1, wherein a combination of N positions comprises between 2 and 25 positions.
- 5 9. The method of claim 8, wherein a combination of N positions comprises between 2 and 10 positions.
- 10 10. The method of claim 1, wherein the method is repeated for a plurality of MALDI targets.
11. The method according to claim 1, wherein the plurality of combinations of N positions is selected using a heuristic method selected from the group consisting of simulated annealing, genetic algorithm, taboo search, hill climbing, conjugate gradient and ant systems.
- 15 12. The method of claim 1, further comprising computing a polynomial transformation from the spectrum of each of the current N positions.
- 20 13. The method according to claim 12, wherein the procedure for calibrating measurements from each P-N position comprises using the polynomial transformation obtained from the closest standard position in the current combination of N positions.
14. The method according to claim 1, wherein the mass spectrum of each N standard-containing position is acquired prior to that of each position to be calibrated with it.
- 25 15. The method according to claim 1, wherein the spectra from positions to be calibrated are acquired in reverse order of their distance to the nearest N standard-containing position.
16. The method according to claim 1, wherein an equivalent number of positions are calibrated from each N standard-containing position.
- 30 17. A method of obtaining a calibrated mass spectrum for a test sample, comprising the steps of:
- (1) positioning standards on a target according to claim 13;
- (2) computing a polynomial transformation from the spectrum of the standard-
- 35 containing position closest to the position of the test sample; and

(3) applying the polynomial transformation to the spectrum obtained for the test sample.

18. The method according to claim 17, wherein the spectrum from each test sample position  
5 is acquired in reverse order of its distance to the nearest standard-containing position.
19. The method according to claim 17, wherein the standards are positioned symmetrically on the MALDI target.
- 10 20. The method according to claim 17, wherein an equivalent number of sample positions are calibrated from each standard-containing position.
21. The method according to any one of the preceding claims, wherein the spectra of the standard-containing positions are re-acquired periodically to reduce temporal errors.